WHAT IS CLAIMED IS:

1.   A magnetoencephalography system, comprising:

a portable cart for moving along the ground;

a SQUID dewar mounted in an inverted manner on the cart;

a headrest assembly mounted on the cart and having a headrest for supporting a head of a patient and forming a portion of the dewar;

the headrest assembly includes an array of magnetic sensors of the SQUID dewar for responding to electrical activity of the brain of the head; and

a patient bed mounted on the cart adjacent to the headrest for supporting the body of the patient with his or her head supported by the headrest.

2.   A magnetoencephalography system according to claim 1, wherein said headrest is concave and is configured in an ellipsoid shape having a sagittal radius of curvature of between about 80 millimeters and about 120 millimeters for the sagittal axis of the head and having a coronal radius of curvature of between about 60 millimeters and about 90 millimeters at the coronal axis of the head.

3.   A magnetoencephalography system according to claim 2, wherein the sagittal radius is between about 90 millimeters and about 110 millimeters, and wherein the coronal radius is between about 70 millimeters and about 80 millimeters.

4.   A magnetoencephalography system according to claim 3, wherein said sagittal radius is about 100 millimeters, and wherein the coronal radius is about 75 millimeters.

5.   A magnetoencephalography system according to claim 1, wherein the

headrest is composed of non-metallic head-insulating structurally strong material.

6.   A magnetoencephalography system according to claim 5, wherein said material is G-10 fiberglass.

7.   A magnetoencephalography system according to claim 1, wherein each one of said sensors is disposed at a spacing distance from the outer head engaging surface of between about one millimeter and about three millimeters.

8.   A magnetoencephalography system according to claim 7, wherein said spacing distance is between about one millimeter and about two millimeters.

9.   A magnetoencephalography system according to claim 1, wherein each one of said sensors is disposed at a spacing distance of greater than about one millimeter from the outer head engaging surface of the headrest assembly.

10.   A magnetoencephalography system according to claim 1, wherein each one of said sensors is a superconducting gradiometer having a pick-up coil diameter of between about four millimeters and about eight millimeters.

11.   A magnetoencephalography system according to claim 10, wherein said pick-up coil diameter of between about five millimeters and about seven millimeters.

12.   A magnetoencephalography system according to claim 11, wherein said pick-up diameter is about six millimeters.

13.   A magnetoencephalography system according to claim 1, wherein each one of said sensors is a superconducting gradiometer having a pick-up coil, said sensors being substantially uniformly distributed relative to the head engageable surface of the headrest, each one of the sensor pick-up coils being

spaced apart by a spacing distance of between about 6 millimeters and about 14 millimeters.

14.   A magnetoencephalography system according to claim 13, wherein said spacing distance is between about 8 millimeters and about 12 millimeters.

15.   A magnetoencephalography system according to claim 13, wherein said sensors are arranged in groups of four, wherein the spacing distance between adjacent sensors of a group is about 8.5 millimeters and the spacing distance between diagonally disposed sensors of a group is about 12 millimeters.

16.   A magnetoencephalography system according to claim 1, wherein said sensors are arranged in groups thereof, and wherein said headrest has a corresponding series of recesses in the rear surface thereof positioned opposite to said groups of said sensors.

17.   A magnetoencephalography system according to claim 16, wherein each one of said recesses is dimensioned to the approximate size of its group of sensors.

18.   A magnetoencephalography system according to claim 17, wherein said recesses are arranged in a honeycomb configuration.

19.   A magnetoencephalography system according to claim 18, wherein each one of said group comprises four sensors.

20.   A magnetoencephalography system according to claim 1, wherein said sensors are arranged in groups of four, each one of said four sensors of a group provides a separate communication channel, the channels being useable individually, or combined or subtracted.

21. A magnetoencephalography system according to claim 1, wherein said cart includes electronic equipment for data acquisition from said sensors, and further including a container composed of conductive material for confining said electronic equipment to shield it from radio frequency interference.

22. A magnetoencephalography system according to claim 21, wherein said dewar has an external coating of conductive material for radio frequency interference shielding.

23. A magnetoencephalography system according to claim 21, further including a direct current power supply for supplying electrical power to said electronic equipment.

24. A magnetoencephalography system according to claim 23, further including a trailer having said power supply mounted thereon and being connected mechanically to said cart.

25. A headrest assembly for a magnetoencephalography system, comprising:

a concave headrest assembly having a headrest for supporting a head of a patient;

an array of ultra high spatial resolution cryocooled superconducting sensors disposed adjacent to the headrest for responding to electrical activity of the brain of the head; and

said headrest being configured in an elipsoid shape having a sagittal radius of curvature of between about 80 millimeters and about 100 millimeters for the sagittal axis of the head and having a coronal radius of curvature of between

about 60 millimeters and about 90 millimeters at the coronal axis of the head.

26.   A headrest assembly according to claim 25, wherein said headrest is concave and is configured in an ellipsoid shape having a sagittal radius of curvature of between about 80 millimeters and about 120 millimeters for the sagittal axis of the head and having a coronal radius of curvature of between about 60 millimeters and about 90 millimeters at the coronal axis of the head.

27.   A headrest assembly according to claim 26, wherein the sagittal radius is between about 90 millimeters and about 110 millimeters, and wherein the coronal radius is between about 70 millimeters and about 80 millimeters.

28.   A headrest assembly according to claim 27, wherein said sagittal radius is about 100 millimeters, and wherein the coronal radius is about 75 millimeters.

29.   A headrest assembly according to claim 25, wherein the headrest is composed of non-metallic head-insulating structurally strong material.

30.   A headrest assembly according to claim 29, wherein said material is G-10 fiberglass.

31.   A headrest assembly according to claim 25, wherein each one of said sensors is disposed at a spacing distance from the outer head engaging surface of between about one millimeter and about three millimeters.

32.   A headrest assembly according to claim 31, wherein said spacing distance is between about one millimeter and about two millimeters.

33.   A headrest assembly according to claim 25, wherein each one of said sensors is disposed at a spacing distance of greater than about one millimeter.

34.   A headrest assembly according to claim 25, wherein each one of said sensors is a superconducting gradiometer having a pick-up coil diameter of between about four millimeters and about eight millimeters.

35.   A headrest assembly according to claim 34, wherein said pick-up coil diameter of between about five millimeters and about seven millimeters.

36.   A headrest assembly according to claim 35, wherein said pick-up diameter is about six millimeters.

37.   A method of magnatoencephalography for the brain of a head of a patient, comprising: supporting the head on a headrest assembly including a headrest mounted on a cart having an array of magnetic sensors forming a part of an inverted SQUID dewar; supporting the body of the patient on a bed mounted on the cart; and detecting electrical activity of the brain of the patient.

38.   A method according to claim 37, further including moving the headrest and the sensors relative to one another to positionally adjusting them.